PGAA Measurements with the LBNL Neutron Facility

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Until now, Prompt Gamma-ray Activation Analysis (PGAA) has been limited mainly to nuclear reactor facilities. The high-flux LBNL neutron generator offers the prospect of PGAA analysis without the restrictions imposed by a reactor. Recent advances in PGAA technology have shown that sensitivity to <0.1 mg of any element, except Helium, can be attained with 10^6 ncm^{-2}s^{-1} from guided beams at reactors. Unlike reactors, there is no highly radioactive core in a neutron generator, so targets can be positioned closer to the source where a comparable thermal neutron flux can be obtained. Figure 1 shows a PGAA spectrum of the moderator and surrounding materials taken with the LBNL

neutron generator operating at a flux of $\approx 10^9$ n/s. The elements H, B, C, O, Al, Si, Cl, Fe, and Ti are identified. Further experiments are planned to investigate the application of PGAA for legacy materials analysis and homeland security applications.

Footnotes and References

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Figure 1. PGAA spectrum of the LBNL neutron generator, moderator, and the surrounding materials. Nine elements are observed. H and C are from the polyethylene moderator, B is from neutron absorber around the detector, Al and Fe are from support structures, Si and O are from the ground, Ti is from the generator target, and the source of Cl is unknown.